

Studies in Diabetes Mellitus

IV. Life History of Three Persons with Relatively Mild, Stable Diabetes, and Relation of Significant Experiences in Their Lives to the Onset and Course of the Disease

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THE natural history of diabetes mellitus as it occurs in childhood and adolescence is different in many respects from that of the disorder as it is commonly seen in the middle-aged adult. In children the onset of the disease is usually abrupt, the symptoms of thirst, polyuria, and weight loss are striking, the insulin requirement is often high, and fluctuations between ketosis and hypoglycemia are distressingly wide and frequent. In the adult, on the other hand, the onset of the disorder is typically insidious, the symptoms may be quite mild, the insulin requirement low, and fluctuations in the clinical state of the patient are relatively slight and infrequent. Because of these differences, many clinicians have felt that these might be etiologically separate forms of diabetes. It has been suspected by some that "adult diabetes" may be the result of a degenerative process in the Islets of Langerhans, while "juvenile diabetes" may be the result of some other mechanism, involving the pituitary and adrenal cortex.

In a previous paper (5) we described the life history and clinical course of 3 persons with the labile "juvenile" form of the disorder, pointing out the relation between significant events in the lives of these persons and the fluctuations of their disease, and discussing the similar studies made by previous investigators. From these observations the following conclusions were drawn:

1. In these juvenile diabetics the onset of the symptoms of diabetes occurred in a setting of significant life stress.

2. Exacerbations of the diabetes, associated with ketosis and coma, very frequently occurred in association with acutely stressful life situations.

3. Remissions of the diabetes, associated with reduced insulin requirements and hypoglycemic reactions, occurred during periods of relative security.

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4. Over-eating was a part of the characteristic response of these patients to stress.

5. Some of the infections which these patients developed were a consequence of their overt behavior in a setting of stress.

6. Thirst, polyuria, dehydration, ketosis, and coma occurred in these patients as a part of their physiological response to stressful life situations. These changes took place even if no significant change was made in their insulin intake, diet, or activity, and in the absence of infection, injury, or unusual exertion.

7. Under controlled laboratory conditions, these patients developed immediate increases in ketonemia when presented with stressful situations which aroused significant conflicts in them. This ketonemia subsided when the stress was removed.

8. Under controlled laboratory conditions, these patients developed an increase in urine output, glucose output, and chloride loss, when presented with stressful situations which aroused significant conflicts in them. These effects subsided when the stress was removed.

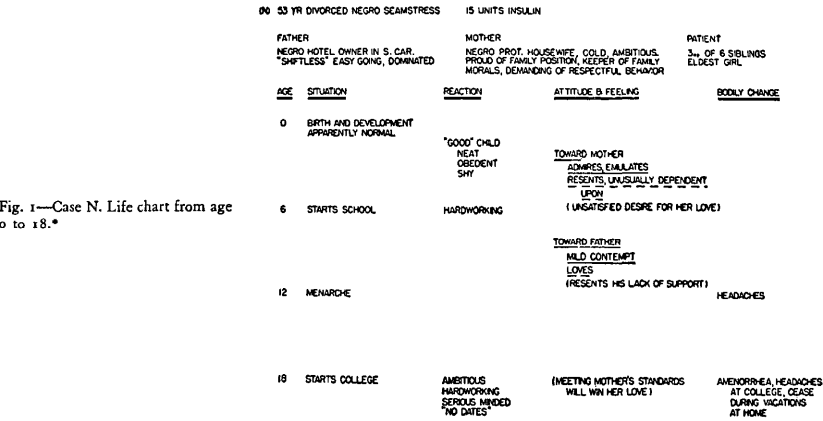
In the discussion of these observations it was suggested that diabetes mellitus is a disorder of adaptation, and that persons showing this disorder react to various life stresses with a physiological response which is appropriate to starvation, but inappropriate to the stresses with which they have been presented.

In view of the supposed differences between "juvenile" and "adult" diabetes, it appeared worth while to examine the histories and course of the disease in several persons with the "adult" form of the disorder in order to compare the two groups. The studies on the "adult" diabetics were made in the same manner as those of the "juvenile" group, the details of which have been described (5). The 3 persons whose histories are presented here are representative of the unselected group of mild and stable diabetics observed in the Diabetic Clinic of the New York Hospital.

Case N (Figs. 1-3).

This 55-year-old Negro seamstress was referred by chance to the investigator when she visited the Diabetic Clinic, where she had been followed for several years. She was the daughter of a Negro hotel-keeper in a small town in South Carolina. Her father she described as a "shiftless" easy-going man, who was affectionate toward his children but could not be relied on to protect them from their mother's occasional anger. He was a poor provider. The patient stated "if he had been more like mother we would have been better off." Her

mother was an ambitious, driving, and decisive woman, who dominated the family and was slightly contemptuous of her husband. As a leader in church and civic activities, and the daughter of a man who had owned 100 acres of land, she considered herself better than her neighbors. Deprecating the Negro customs of the locality, she attempted to make her family emulate the behavior of the more educated whites. She impressed upon them the value of "correct" speech and dress, and of "correct" sexual behavior. Although she "did everything" for her family, she was cold and unaffectionate



* *Explanation of the Diagrams:* In the diagrams of the life histories, the age of the patient is in the first column and the significant events of his daily life are listed under *situation* in the second column. In the third column, under *reaction* are described the overt behavioral reactions of the patient at the time, as observed by relatives and remembered by the patient. In the fourth column, under *attitude and feeling* are described the inner reactions of the patient to his life situation. Those reactions underlined in solid lines are those of which he was quite aware and which he easily recalled; those underlined with broken lines are those of which he was less aware, put into words reluctantly, and admitted only in periods of confidence; those enclosed in parentheses are those of which the patient was unaware—they represent the inferences by the physician drawn from the patient's dreams, associations, figures of speech, behavior, etc., and in this sense they more or less represent his "unconscious" or "repressed" attitudes and feelings. In the last column are described the somatic changes which occurred at the same time as the events and attitudes in the previous columns. The width of the wavy black column representing diabetes is intended as a rough-indicator of the severity of the disease as estimated from the amount of insulin required to prevent symptoms. Insulin dosages as represented by the squared black column are likewise not exact, but represent approximations, for reasons which are explained in the text.

toward them. "She never hugged or kissed us or picked us up. She wasn't that kind of person. When we pleased her she gave us something we wanted, and when she was angry with us she took something away from us." "We had a little colored girl to mind us. We saw more of her than we did of mother." She described the family as happy and "close knit." "We were clannish. We relied on each other." One older brother died at 25 of a brain tumor, another had a peptic ulcer, and a younger one had hypertension. She also had two younger sisters. There was no family history of diabetes mellitus. The patient was born in 1895, after a full-term uncomplicated pregnancy. She was breast fed for one year. Her early development was normal so far as she knows, and she had no "neuropathic" traits. As a child in grammar school she was "what you might call a goody-goody child," quiet, obedient, shy, soft-spoken, and rather plump. Although she was not an outstanding student, she worked hard and was "serious minded." Of all of the children she was closest to her mother. "I always was very fond of my mother. I guess I was just more like her than the rest—I was quiet, and I didn't show my feelings or speak out." When she entered adolescence she "didn't take any interest in boys,"

and scorned the casual sexual habits of the other boys and girls. She stayed home, became interested in sewing, and "planned for the future."

She determined to become a schoolteacher. Although there were few Negro colleges in South Carolina at that time, by great effort she was able to gain admission to one. Here she repeated her pattern of constant hard work and few social activities. Throughout her college period she had many headaches. Her menses, which had been painful from their onset, now became irregular. "They would go away while I was at school, and then when I got back home in the summer they would return." Shortly after her graduation she developed a "nervous breakdown." She recalls that she became depressed and anxious, was unable to sleep, had no ambition, was tired all the time, and had "terrible pains in

brother, her widowed sister, and her sister's daughter. Here, for five years, she worked happily as a seamstress. She and her sister became "very close," and she considered her niece "just like a daughter." She was healthy during this period except for gradually increasing obesity. In discussing this she said, "When I am sad and lonely I get an awful hungry feeling inside me. I just can't stop eating."

When the patient was 38 her mother suffered the first of a series of "strokes," and became an invalid. For two years the patient nursed her. When she died the patient became depressed, ambitious, and "cried all the time." "I'm still depressed," she says, "I never got over it." Her sister became her chief source of emotional support, but two years later her sister died suddenly and unexpectedly on Christmas Eve. "That was the greatest

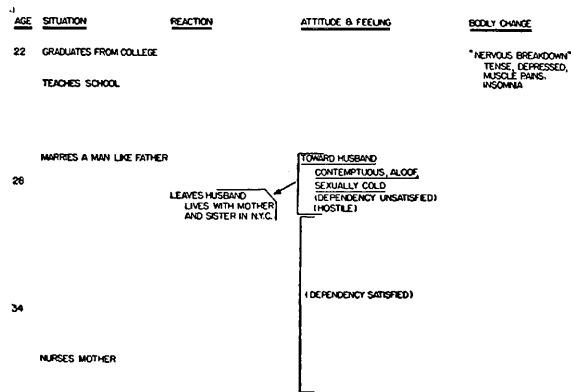


Fig. 2. Case N. Life chart from age 20 to 36.

my legs." "All I wanted to do was go home to mother." She did so, and recovered after six months.

For five years thereafter she taught at Negro schools in the South. When she was twenty-eight she married a Negro veterinarian who was also a college graduate, but who was "temporarily" working as a shipping clerk. The marriage was unsuccessful from the start. She was distressed at his failure to maintain his status as an "educated" man and his return to the habits and attitudes of day laborers. She was "not much interested in sex" and derived no satisfaction from sexual relations. Throughout the entire period of her marriage she had moderately severe menorrhagia, and she never became pregnant. She and her husband spent more time with their parents than with each other. After seven years they dissolved the marriage by mutual consent.

The patient now moved into an apartment with her parents, who by this time had moved to New York City. The quarters were shared by her unmarried

shock I ever had." "I was more lonely and depressed than ever." "I haven't been the same since." She became increasingly depressed and "tired all the time." She began to lose weight. She fell and broke her ankle. During her convalescence she was "more lonely and depressed than ever." In this setting she developed thirst and polyuria, and was discovered to have diabetes mellitus.

At first her diabetes was readily controlled by diet alone. She gradually recovered from her depression, and for three years led a relatively tranquil life as housekeeper for her brother, father, and niece. At this point her father developed cancer, and had to be nursed through a long terminal illness. Again in a setting of depression she noticed fatigability, weight loss, thirst, and polyuria as well as joint pains and "numb feelings" in her legs. Her physician attempted to get her to take insulin, but she stopped after a few doses because she did not like the injections. After a few months she

began to feel more cheerful again and her symptoms gradually subsided. She remained relatively well for the next three years.

In 1946, when she was fifty-one years old, she consulted the New York Hospital because of feeling "tired and blue," "just before Christmas" "for no reason I know." Joint pains had recurred, associated with low back pain and weakness in the legs. At this time she was described as an obese middle-aged Negro woman. On physical examination the only significant abnormalities noted were a blood pressure of 152/88 and a 10 X 10 cm. retro-uterine mass which was thought to be a fibroid tumor of the uterus. Her urine contained sugar and occasional traces of albumin, but sugar-free specimens concentrated to 1.027. A random fasting blood sugar was 210 mg. per 100 cc. She was put on a 1200 calorie diet (P 64, F 53, Cho 125 prescribed). Although

Although her muscular function returned in part under physiotherapy and she was again able to walk, she remained apathetic and depressed. There were no major fluctuations in her diabetes, however, which continued to require 15 units of protamine insulin a day. She continued to return to the Diabetic Clinic at intervals of several months. At one of these visits, a year after her operation, she was by chance assigned to one of the investigators in the absence of her regular physician.

Course Under Observation

When first seen she appeared to be a plump, jolly, colored woman with a ready smile and an ingratiating manner. She expressed very few of her complaints, and had the manner of a happy and "well-adjusted" person.

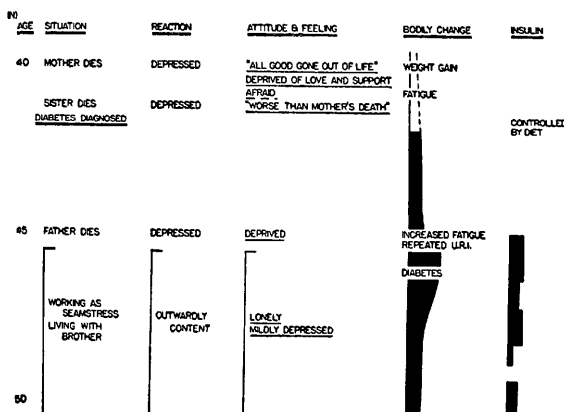


FIG. 3. Case N. Life chart from age 40 to 50.

she reported an intake of 1213 and 1593 calories the next two times she was seen, she failed to lose weight and continued to have glycosuria. Because it was felt that she was not following her diet, and because she continued to have thirst and polyuria, she was given a new diet (P 75, F 60, Cho 200) and 15 units of protamine insulin daily. On this regimen her diabetic symptoms disappeared and her weight remained stable.

She was admitted to the hospital for a total hysterectomy because it was felt that her pelvic tumor might be the source of her back pain and leg symptoms. She withstood the operation well, although she had ketonuria for forty-eight hours afterward, for which she was given 50 units of insulin in addition to her usual dose. As a complication of the operation, and apparently because of the weight of her legs in the stirrups, she developed bilateral peroneal palsy from which she never fully recovered.

However, she rapidly changed her manner as soon as the physician began to take an interest in her. She described nightmares, sleeplessness, fatigue, and a feeling of complete hopelessness. At a time when jobs were plentiful she "just couldn't get the energy to hunt for a job" and she had had to spend almost all of her savings to support herself. She sat home all day, brooded, and felt bored and lonely. She had a strong suspicion that the operation had caused the injury to her legs, and felt that this had purposely been concealed from her by the surgeons who cared for her. When questioned about her diet she readily admitted that her reported caloric intakes were wrong. "When I am blue and worried I can't help eating." "I can always tell when my sugar is high. It's when I'm feeling sad."

Because her obesity greatly increased the handicap of her weakened legs, she was put on 1200 calorie diet after the physician had carefully explained to her its

necessity, and made it clear that he would not reject her if she was unable to follow it. She was in fact quite unable to do so. "I just can't follow a diet. The other night I sat down to read a book and there was a box of crackers on the table beside me. When I finished the book the crackers were gone, and I didn't no more remember eating them things! I just don't know what all I nibble."

When she was followed in the clinic at two-week intervals it was found that on her daily intake of 15 units of protamine insulin her weight remained relatively stable and she had only rare diabetic symptoms and no insulin reactions, although she had intermittent glycosuria. She withstood several upper respiratory infections accompanied by fever and general malaise without developing ketonuria or dehydration, although she had some polyuria.

On one occasion after an argument with her landlord who threatened to evict her, however, she developed thirst and moderate polyuria and nocturia lasting for two days. On another occasion when she was unusually depressed and worried about money she had similar symptoms for several weeks. Under the pressure of economic necessity and with the aid of Social Service she found a number of part-time jobs, and was finally able to keep herself busy most of the time with work which she did at home. In the meantime she was allowed to work out her hostility toward the hospital by expressing it to her physician and acting it out in her behavior toward him.

As she continued to work she became less depressed, and as time passed she developed a dependence upon the physician which seemed helpful to her. She voluntarily sought another diet, which she was now able to follow. Her weight fell from 78.2 Kg. to 71.2 Kg. over the course of three months, with consequent improvement in her mobility. She was taken off insulin because of the improvement in her diabetes. When last seen, although she was still somewhat depressed, she was working steadily, having no diabetic symptoms, having only occasional glycosuria, maintaining her weight at a low level, and not taking insulin.

Short-Term Experimental Observation (Fig. 4).

For several months after she was first seen she had intermittent periods of suspiciousness and resentment

toward the physician, which accompanied periods when she brooded about what had happened to her legs. During this period her lack of money caused her increasing discomfort. Finally she succeeded in finding a temporary job working at the home of a wealthy woman in the suburbs. On the morning on which she was supposed to report for work the physician asked her to come to the laboratory without breakfast "for a test." She told him on arrival that she had to "get away soon to catch a train." After baseline blood and urine samples were obtained she waited quietly in a chair for an hour and repeated her statement. The physician, instead of acknowledging it, began in a brusque and peremptory manner to draw blood samples from her at frequent intervals, without telling her either what he was doing or why he was doing it.

Her face became sullen, her jaws tense, and she began to click her teeth at frequent intervals; but she said nothing. Shortly she began to complain of the delay, complained of the heat, and the pain of the venipuncture; and she dwelt on the difficulty she had had with her legs since operation.

"I still haven't paid the hospital bill, and don't know when I ever will."

At the end of an hour the physician changed his manner, becoming attentive, sympathetic and reassuring. He told of having made special arrangements for her to catch the train in adequate time. At this she

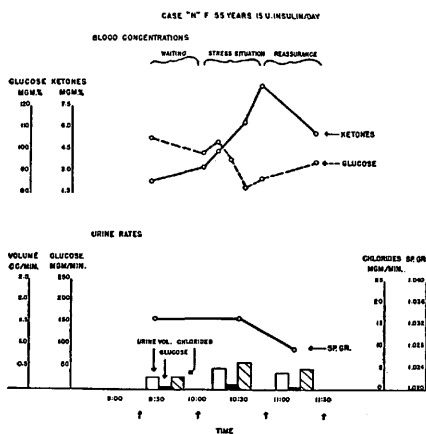


FIG. 4. Case N. Rise in concentration of ketone bodies in blood associated with an experimentally induced stressful situation.

became more cheerful and composed.

During the discussion of this episode at later interviews she described freely her anger at the physician for "experimenting" on her and jeopardizing her job. Her anger had largely subsided, however, when she was assured that she would not miss her train.

The method by which studies such as this are performed has been described in detail elsewhere (1). During the course of the procedure the ketone bodies in the patient's venous blood rose steadily from an initial level of 2.3 mg. per 100 cc. to a high of 8.9 mg. per 100 cc. after the end of the second hour; then, after reassurance they fell again to 5.6 mg. at the end of the third hour. During the stress period her blood glucose fell from 102 mg. per 100 cc. to 82 mg. per 100 cc., rising gradually to 95 mg. at the end of the third hour. The changes in the rate at which she excreted water, glucose, and chlorides in her urine were so small as to be insignificant.

Comment

The changes in the blood ketones and glucose which occurred in this mildly diabetic middle-aged woman were qualitatively the same as those which were seen in the group of severe diabetics, and may be compared with those observed in a 20-year-old girl with severe and labile "juvenile" diabetes whose case has been described in detail (5). The rate of rise and the magnitude of the increase were somewhat less in this experiment. It is notable that the woman in the present experiment neither developed a diuresis during the procedure, nor did she become

usually associated with feeling states of overt anxiety and apprehension, which the woman described above apparently did not experience. The loss of glucose and electrolytes associated with diuresis appears to be more important in the production of the symptoms of ketosis and coma in diabetics than does a simple rise in ketonemia unaccompanied by diuresis.

Case T (Figs. 5 and 6).

This 70-year-old unemployed German was referred to the Diabetic Clinic when he was discovered to have

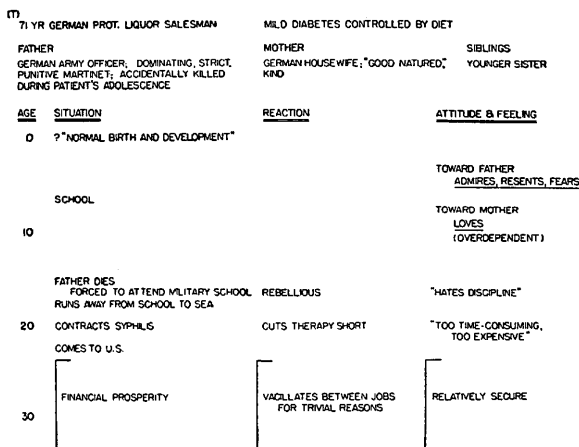


FIG. 5. Case T. Life chart from age 0 to 30.

ill; whereas the girl referred to above had a pronounced diuresis and became noticeably ill. Elsewhere in a detailed report of experiments it was shown that in diabetic persons under no stress the ketone level is relatively stable throughout a morning (as may be seen in Fig. 7), but that stressful life situations consistently provoke rises in the blood ketones of both diabetic and nondiabetic persons, and that this ketonemia usually subsides when the stress is removed (1). Stressful experiences have also been found to lead to a fall in the blood glucose of unfed diabetic persons (6, 7), diuresis of water in nondiabetics, and of water and glucose in diabetic persons (2, 3). In the earlier publication it was pointed out that the diuresis was not attributable to the increased excretion of either glucose or ketone bodies.

In our former studies it has been found that situations which engender diuresis in subjects are

diabetes during a hospital admission for repair of an inguinal hernia. His case was assigned, by chance, to one of the investigators.

The patient's father was an officer in the Prussian Army who had retired to a Civil Service position. A strict, stern, cold, and exacting man, he was distant from his children, but apparently impartial in dealing with them. He dominated the family, and demanded that his children be obedient, be truthful, not complain, and take punishment and adversity "like a man."

The patient's mother was a more easy-going and tolerant person, who took a protective attitude toward the children, but showed little outward evidence of affection toward them. The patient recalled no serious discord between his parents.

Two elder sibs had died in infancy before the patient's birth; the only other child was a sister 2 years younger.

There was no family history of diabetes.

Details of his birth and early development are not known, but so far as he knew he had been a healthy

baby. His earliest memories concerned his school days. "I was a tough one," he said. "Always getting into fights and scrapes. Ja, I made plenty trouble. They couldn't make me behave." He recalls that his sister often "told on him," and that he disliked her for it. His father punished him repeatedly for misbehavior, sometimes corporally, but more often by depriving him of his dinner. "I can't forget that," he says. "I had to stand at attention by the table and watch them eat. Was I hungry! Plenty of times I went to bed hungry like that." This is one of the most vivid memories of his childhood.

When he was 11 years old his father was accidentally killed. As the son of a former officer, the patient was given a scholarship to a military school, where he stayed five years. But he "just couldn't stand the disci-

At the age of 29 he became a whiskey salesman and soon became prosperous. "I was happy-go-lucky. Everybody liked me." He continued to live a carefree and irresponsible life until he was 39, when he married again. His second wife was good-natured, affectionate, and "took care of me." She also was German, and much like his mother. He decided to "settle down." "After that I worked hard and worried." Although there were no children, this marriage continued happily for fifteen years. "We never quarreled. She was a very fine woman. Those were the happiest days of my life." He continued his work as a "whiskey salesman" throughout the period of Prohibition, and prospered. He invested in real estate, and after several years he owned several houses, which he rented.

In 1932 his wife developed nephritis and died after a

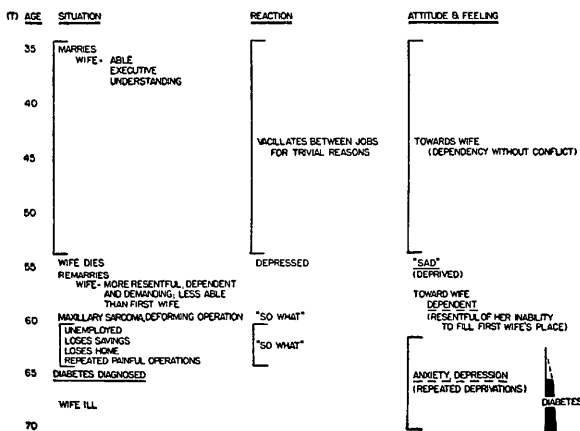


FIG. 6. Case T. Life chart from age 35 to 70.

pline," so he ran away to sea. From the ages of 17 to 20 he traveled all over the world as a seaman. "I went everywhere and saw everything. It was easy come and easy go. I made plenty money and spent it all. I got into plenty scrapes." In Egypt he contracted syphilis from a prostitute. "We didn't think nothing of those things," he said. The diagnosis was made clinically on the basis of a penile sore followed by a secondary rash. He received 60 mercury rubs over a three-month period at that time, and a similar course of treatment three years later.

In 1900, at the age of 22, he came to the United States because he was "tired of being a sailor." For a while he worked in a restaurant, but he soon became bored by that also. During the next six years he drifted from job to job, although he was never unemployed. During this period he married a German girl of his own age who shortly afterward developed an acute psychosis and died in a mental institution. He was reluctant to discuss this marriage.

lingering and expensive illness. After losing his savings in a series of bank failures he was forced to sell his real estate in order to pay her hospital expenses. With the repeal of Prohibition he lost his "business" and was forced to take a job as a bartender. In this setting he became depressed, nervous, sleepless, and lost his ambition. "I gave up," he said. "I quit working and I quit worrying." He married a middle-aged widow, who was an apartment house superintendent, hoping that she would take care of him as his second wife had. Although a neat, meticulous housekeeper, she was cold, unaffectionate, and had a bad temper. He was unhappy in this marriage, although he stated, "I don't complain about her."

Four years after his marriage he was admitted to the New York Hospital because of a swelling inside his nose. On physical examination at this time he was described as a large, well-nourished, middle-aged man, who did not appear ill. In addition to the mass, his other significant physical abnormalities were a blood

pressure of 170/80, a right indirect inguinal hernia, and generally diminished deep tendon reflexes. His knee and ankle jerks were not obtainable, but other neurological signs were absent. His serologic tests were strongly positive (Kline diagnostic, Kline exclusive, and Wassermann, 4 plus). His cerebrospinal fluid protein was 30 mg. per 100 cc., the Wassermann was negative in all dilutions, and the colloidal gold curve was 001000000. His weight was 77.6 Kg. Biopsy of the nasal lesion led to the diagnosis of reticulum cell sarcoma.

Although he was cooperative and superficially cheerful at this time, he told the social worker that he was "sad all the time" and that he had had insomnia for two years because of "worry over his financial condition." He was unemployed and living in a one-room apartment with his wife, who received free rent and \$40 a month for being janitress to the building.

Two of three urine samples examined during this admission contained a trace of glucose.

His syphilis was treated with bismuth, potassium iodide, and neoarsphenamine. X-ray treatment was applied to the growth in his nose, but because the growth increased in size and became ulcerated it was ultimately necessary to perform a radical resection and reconstruction of the maxilla.

During the two years required to accomplish the extensive surgery he remained outwardly cheerful and uncomplaining, but was inwardly depressed, tense, sleepless, and worried. His blood pressure varied from 130/80 to 160/90. Despite his many illnesses his weight gradually rose to 79 Kg. He observed that when he was sad and worried he became hungry, and ate more. At each of his admissions traces of glucose were found in several of the urine specimens which were studied, but no significance was attached to this finding; urine specimens examined in the out-patient department were usually free of glucose. At the time of his most extensive plastic operation, however, four out of seven urine specimens contained glucose, and in two specimens the qualitative test was "2 plus." Two fasting blood sugars were 107 and 108 mg. per 100 cc. He had no thirst or polyuria.

Because of recurrent complications, a satisfactory cosmetic effect was never achieved, and he was unable to secure employment. After repeated failure of the plastic procedures he finally accepted his face as permanently disfigured, and himself as permanently unemployed and entirely dependent on his wife. When he was readmitted to the hospital in a state of dejection after the final failure, all of his urine samples showed glucose for the first time, and his fasting blood sugar on two occasions was 164 and 161.

Although it has been pointed out that his wife was critical and unsympathetic, she had nevertheless been his one source of financial and emotional support. Now she developed angina pectoris, and was found to have hypertension and an enlarged heart. Her physicians warned him that she was "liable to die if she didn't take it easy." He tried to help her in caring for the

apartment, but her meticulous and compulsive nature prevented her from resting as he wished. She "had to have everything just right" and did not like the way he did things. She insisted upon washing walls, sweeping rooms, and scrubbing stairs as hard as ever. Often her activity resulted in anginal attacks, which frightened him. He remonstrated with her. They argued, and this led to further anginal attacks. "So I gave up," he said. "You can't do anything with her."

After five years of this he finally secured a job as a minor official in his old union. The pay was only \$40 a month, but the job meant a great deal to him. He soon discovered, however, that his fellow officers were receiving graft for writing contracts favorable to the employers. When he refused to take part in this, vigorous and threatening attempts were made to remove him from his job. At the same time his wife developed severe angina and cardiac decompensation. The patient began to have right lower quadrant pain, epigastric distress, sour eructations, lower abdominal cramps, constipation, and occasional dark stools. Gastrointestinal X-rays showed "antral gastritis." At the time that these symptoms were beginning it was felt by some observers that they might be related to his old hernia, inasmuch as it had recently been uncomfortable and difficult to retain by truss. He was admitted to the hospital, and a herniorrhaphy was performed uneventfully. All of his urines contained 2-3 plus glucose during this admission, and his fasting blood sugar was 171 mg. per 100 cc. on one occasion; but his twenty-four-hour urine volume was only 1500 to 2000 cc., and he had no diabetic symptoms. The first formal diagnosis of diabetes mellitus was made at this time, and he was referred to the diabetic clinic upon discharge.

Course under Observation

When first seen this patient was a well-preserved, husky, and relatively healthy looking man of 68. His blood pressure was 138/64, and he had no cardiac enlargement; but his peripheral vessels were thickened and easily palpable. The tendon reflexes were diminished in his arms and absent in his legs, and vibration and position sense were somewhat impaired in his toes. Except for his facial deformity and operative scars there were no other significant physical abnormalities.

He was co-operative, grateful, uncomplaining, and superficially jolly—the picture of a "stable personality" as popularly conceived. He readily told of his past misfortunes and operations, describing appropriate feelings but not displaying them. He smiled, shrugged his shoulders and said "I don't complain. What's done is done and what's gone is gone," giving every appearance of a man who had completely mastered his troubles and adapted himself to his difficulties. He mentioned that his wife was ill, and that it distressed him, but said nothing about his arguments with her and his difficulties with his union. His diabetes was easily controlled by simply restricting his intake of concentrated carbo-

hydrate to a moderate degree; thereafter he had only traces of glycosuria.

After five initial interviews he was followed at intervals of three months. For a year he had no further difficulties with his union, and his wife was relatively well. During this period he was asymptomatic. When a new attempt was made to oust him from his job, involving violent arguments, charges, counter-charges, and threats of violence and arrest, however, he developed acute abdominal pain, intractable vomiting, constipation, and tarry stools. He was admitted to the hospital acutely ill, with a diagnosis of intestinal obstruction. Although his urine showed a positive test for glucose and trace of ketones, he was only slightly dehydrated and was not hyperpeptic. His blood glucose was 290

Short-Term Experimental Observation (Fig. 7).

After his discharge from the hospital on the occasion of the bleeding from his peptic ulcer, he was called to the laboratory for an experiment to be performed in the manner which has been described. He had not previously discussed the episodes leading up to his admission, and it was planned to question him about these matters in the hope of placing him in an acutely stressful situation associated with significant conflict feelings. After baseline blood and urine samples were obtained, the interview was abruptly begun. Instead of responding with his usual bland denials and failure to complain, he suddenly burst forth with a torrent of pent-up feeling. Shouting that his fellow union officers were

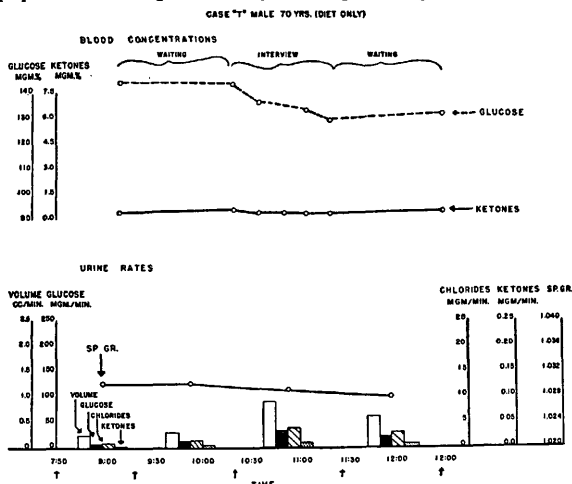


FIG. 7. Case T. Absence of significant changes in blood ketone concentration during an interview which was not stressful. Small changes in urinary output may be in part related to ingestion of water.

mg. per 100 cc., CO_2 combining power 64 vol. per cent, and serum chlorides 89 mEq./liter.

After restoration of his fluid balance and a period of observation it was found that he had an "acute gastritis and duodenitis" associated with an active duodenal ulcer. His ketonuria disappeared without the administration of insulin. Ulcer symptoms subsided rapidly on frequent feedings and anti-acids. After his discharge from the hospital he voluntarily gave up his job with the union because "the aggravation was making me sick." Since that time he has had no ulcer symptoms. His therapy thereafter consisted largely of the interest, support, and friendly discussions of his physician which took place at the time of his clinic visits, and the help which social service and the hospital physicians were able to give him in caring for his wife and obtaining financial assistance.

scoundrels, crooks, and thieves, he proudly and angrily declared that they would never make a crook out of him. With almost no prompting he berated them violently for a half hour. Then he turned on his wife and told the physician of the tremendous anguish she had caused him. Again he gave free vent to his resentment at her failure to take care of herself and to listen to his pleading, as well as his fear that she would die suddenly and leave him alone in the world. During the entire hour he paid very little attention to the attitude and questions of the physician, but went on to speak freely whatever came into his mind. When the interview ended he smiled, thanked the interviewer for his interest, and spoke of how much better it had made him feel to be able to talk about these matters which had bothered him so much. It was apparent that the interview, which had at first been intended as a stressful

experience for him, had released more tension than it had generated.

There was no significant change in his blood ketones during the procedure (Fig. 7), and the fall in blood glucose was only slightly larger than might be expected in a quiet morning without food. Although he received 200 cc. of water by mouth during the first and third hours and 175 cc. of 0.9 per cent saline by intravenous injection during the interview hour, his rate of urine output during the three hours changed very little. The change in the rate of water and glucose excretion from the first to the second hours was not as large as the changes usually seen under stress (2) although it is qualitatively similar. He developed no epigastric symptoms during the interview hour.

tility toward the interviewer. It is of interest that the rise in blood ketone concentration, which we have often observed in diabetics in association with feelings of deprivation associated with hostility, did not take place during this interview, although a slight diuresis, similar to that seen in many anxious persons, did take place.

On the other hand, 33 other persons with diabetes mellitus, and 12 nondiabetic persons, have been subjected to interviews similar to this and we have produced significant rises in the blood ketones of all of them. These persons gave evidence from their actions and statements at the time, and from their memories and associations at later interviews,

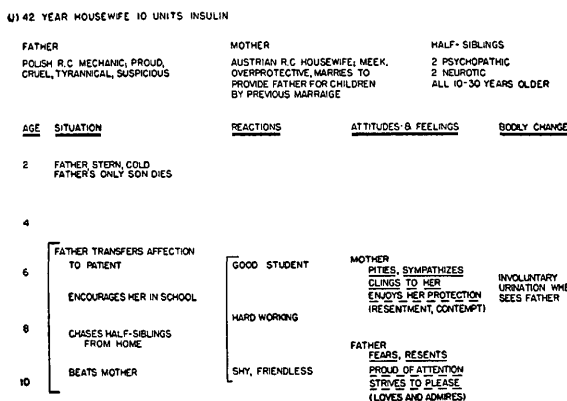


FIG. 8. Case J. Life chart, age 0 to 10.

Comment

This episode illustrates some of the complexities involved in experimentation of this type. In attempting to create a stressful situation for an individual through the vigorous discussion of his significant conflicts, one cannot be sure at the outset of the experiment that the actions of the interviewer will produce the desired reaction in the subject. It was hoped that this man would react to the interview situation with thoughts of being rejected by the physician and deprived of his friendship and support, associated with some anger toward him. Instead, he interpreted the interview as a welcome opportunity to express his feelings, and regarded the interviewer's questions as expressions of stern but friendly interest. "You treat me like a Dutch Uncle," he said, with evident gratitude. Although the free expression of his long-suppressed feelings was associated with some anxiety, he felt no hos-

that the situation had been a stressful one for them, and had been associated with thoughts of being rejected by the physician, threatened by him, and deprived of his friendship and support; and these thoughts had been associated with hostile and resentful feelings. Four other individuals, however, reacted as this man did, indicating that the situation was not threatening or unpleasant to them. In them there was no rise in ketones. It appears, therefore, that it is not enough simply to discuss topics to which the individual is sensitive, or to allow free vent to suppressed feelings, in order to create a "stressful situation" for a person. The significance of an experience to the subject apparently determines whether or not it is stressful to him.

Case J (Figs. 8-11).

This patient was a 43-year-old housewife whose father, a Pole, had a violent temper, and was known

as "eccentric." He maintained that he came from a noble family, and said he had come to this country because his family had "cheated him out of his inheritance." At home he was a brutal tyrant, who beat his wife and children, kept them in a tenement, and gave them almost no money to live on, although he made a modest living as a mechanic. For himself he bought custom-made suits, affected a top hat and a cane, and attended the opera alone.

Her mother was a Hungarian widow who came to this country with her four children about 1902, and married the patient's father shortly thereafter. The patient describes her as quiet, soft-spoken, "affectionate," and completely dominated by her husband, whom she both feared and resented. The patient's eldest half-

keep a book in which she recorded every penny she spent. He quarreled with her repeatedly and threatened to leave her. She submitted to this with silent resentment, apparently because she felt unable to rebel and leave him.

The patient's memories of this period are mixed and unpleasant. She remembers violent quarrels. "He used to beat mother if she wouldn't have intercourse with him three times a night." Occasionally he would leave home, taking his daughter with him to "dirty rooming houses" where "he didn't keep me clean" and "horrible men used to feel me and try to take my clothes off when he was away." "Once one of them exposed himself to me—it was the most disgusting thing I ever saw." Yet she remembers that he seemed fond of her and proud

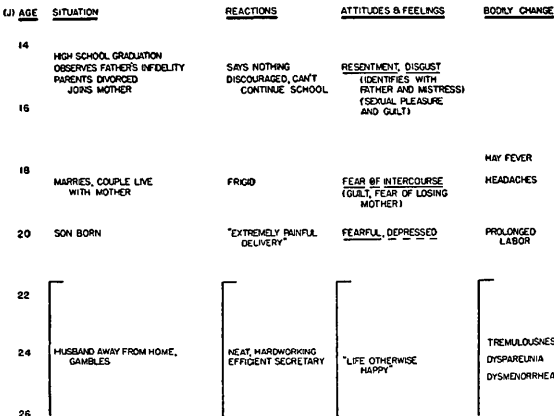


FIG. 9. Case J. Life chart, age 14 to 26.

brother was an institutionalized psychotic. The next eldest half-brother was "nervous" and had asthma. The third had a long history of juvenile delinquency and adult vagabondage. Her half-sister died in a sanitarium after a "nervous breakdown."

There was no family history of diabetes.

The patient was ten years younger than her half-sister, and was known as "the baby of the family." She was born in 1905, and, so far as she knows, the pregnancy, her birth, and her early development were normal. Her father had wanted a child "to carry on his name," was overjoyed at her birth, and "spoiled" her until three years later when twin boys were born. Only one survived, but he became then the center of his father's life, and the object of all of his ambitions. The death of this child at the age of 2 was a great blow to the father. He became bitter and morose, and began to drink heavily. He whipped his stepchildren with a "cat-o'-nine tails," drove them from the house, and had one of them put in a reform school for stealing milk bottles. His wife had to beg him for a bare subsistence. He accused her of stealing from him, and made her

of her. He used to dress her up and take her to walk with him, something he "never did for my mother or anyone else." He was proud of her when she did well in school, and once gave her five dollars because she made good grades. But he was intensely jealous when her mother showed any affection toward her. Her mother took every opportunity to win her affection and "protect her," but had to conceal her actions. As an example of this she recalls that she "loved candy," but her father forbade her mother to give her any; her mother used to buy it for her surreptitiously as a great treat.

During this period the patient was a shy, studious, plump little girl, who was obedient and soft-spoken. She was terrified of her father and his unpredictable rages. "I used to run behind the door and wet my pants when he came into the house." On the other hand, she felt proud of how he looked when he walked down the street with his cane and his Van Dyke beard, and was pleased when he took her with him. She was outwardly convinced that her mother was the kindest, sweetest woman in the world, and her father was a brutal ogre.

She was extremely close to her mother. "There was no one like her to me, and there never can be. She was a part of me. She never cried, never complained. When my father wouldn't give her any money she used to make artificial flowers at home just to have enough money to buy me clothes."

During her adolescence the strife between her parents reached a climax. Her father became increasingly drunken and abusive, and associated openly with other women; yet he continued to show favor to his daughter while abusing her mother. When the girl graduated from grammar school she received a prize for her good grades. Her father bought her a new dress, put on his finest clothes, and walked to the platform with her to receive the congratulations of the mayor. He refused to bring her mother along with them, and forced her to

because of his juvenile delinquency and seemed pleased to be able to move in with the patient and her mother. The patient considered him a "dashing" and popular man, who "swept me off my feet." Her mother "loved him like a son." Prior to marriage, one of his most attractive features to the patient was that "he was never fresh and never tried to kiss me." The patient was appalled by the prospect of heterosexual relations, and for two months after marriage managed to avoid intercourse. Always thereafter she was frigid and had dyspareunia. Her pregnancy, which occurred a year later, was an "ordeal" for her. She was terrified of childbirth, had a prolonged, painful, "dry" delivery, "was very nervous," and resolved never to go through such an experience again. Despite these handicaps, however, the marriage continued, although the patient's

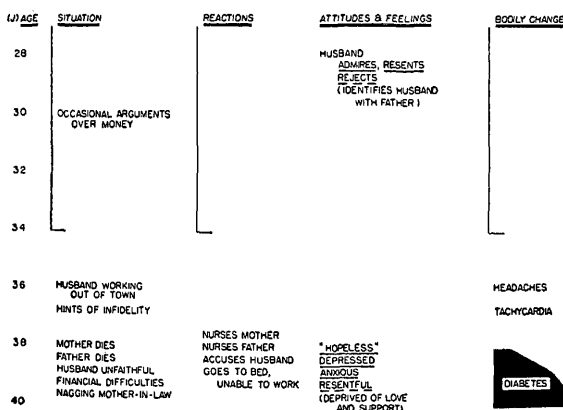


FIG. 10. Case J. Life chart, age 27 to 40.

come alone and sit in the back of the hall, shabbily dressed. A few months later he drove his wife from the house and threatened to shoot her, then took the girl with him to visit one of his mistresses in a nearby town. She returned to her mother as soon as she could, and testified against her father in a series of sordid hearings in the domestic relations court which ended in the dissolution of the marriage by divorce.

After her parents' divorce she shared an apartment with her mother and became a stenographer. Her menses had begun at 13. She understood that they were a normal function of womanhood, but received no instruction in caring for herself. She regarded them as dirty and unpleasant, and from the first she had moderately severe dysmenorrhea. She considered that men were difficult to get along with and "fresh." The few friends she had were girls, from whom she picked up the small amount of sexual information which was all she had before her marriage. She had no dates until she was 19, when she met and shortly married a professional dancer. He had been abandoned by his parents

primary attachment remained with her mother. She was content to allow her husband to go his own way, demanding only that he dress nicely and take her out dancing.

When the patient's son was two years old she went to work as a medical secretary. She was considered neat, meticulous, hard-working, conscientious, and well-dressed. On Sundays she taught in the church school. For fifteen years her life proceeded relatively uneventfully in this manner, while she disregarded occasional hints that her husband was "going out" and "spending money on women and horses." He had given up dancing by this time, and made a moderately good income in his brother's business. Matters went well until the business was transferred to another city when the patient was 36. Almost at the same time her mother had a "small stroke." Faced with the choice of going with her husband or staying with her mother, she unhesitatingly chose to stay with her mother.

As her mother became increasingly ill over the course of several months, the patient began to have "nervous-

ness," palpitations, dysmenorrhea, diarrhea, and chronic right lower quadrant pain. When her mother died suddenly she developed a "nervous breakdown." For four months she was depressed, tremulous, unable to sleep, cried, complained of pains in her head, blurring of vision, intense fatigue, and epigastric distress, "like hunger pains." "I never got over my mother's death," she says. "When I lost her I lost everything." At this time her thyroid was found to be enlarged. Her BMR was "plus 22" and her blood glucose was said to be elevated, although she had no glycosuria.

For four months she remained in bed, taking Lugol's solution. Then she joined her husband in the other town. Instead of offering her emotional support and caring for her as her mother had, he was indifferent and neglectful. When she learned several months later that he had a mistress she became violently angry and felt utterly deprived and depressed. Her old symptoms became much more intense, and this time she was found to have glycosuria. Her physician prescribed a "diabetic" diet, and 12 units of protamine insulin daily. By furious demands and complaints she succeeded in forcing her husband to return with her to their original home. He went off for long week-end trips and continued to neglect her both emotionally and financially, however, and she remained depressed and intensely resentful.

For about six months she continued to take insulin and remained free of either diabetic symptoms or insulin reactions. At this point she suddenly learned that her father, whom she had not seen for years, was ill in a city hospital. She took him home and nursed him, finding him "much kinder and better than he had ever been before." She began to have frequent insulin reactions, and her insulin was reduced and then eliminated altogether. She nursed him for several months. When he ultimately died her "nervous" symptoms returned, but she continued to have so little evidence of diabetes that her physician began to doubt his original diagnosis. During this period her husband appeared to have given up his mistress and explained away his trips as "business trips." For one year she lived in precarious security.

However, because she continued to complain of "excessive nervousness, irritability, weight loss of 20

pounds (over four years' time), headache, feeling of pressure behind the eyes, tremor of the hands and difficulty holding objects, increase in fatigue and weakness with inability to perform household tasks, inability to concentrate, palpitation, diarrhea, and frequency of urination," and made herself a semi-invalid because of this, she was re-evaluated for evidence of Graves' disease. On physical examination at this time, she was found to be a somewhat thin, tremulous, apprehensive woman, with a moderately and symmetrically enlarged thyroid. She had no exophthalmos or lid lag, her BMR was "minus 1," her blood cholesterol was 197 mg. per 100 cc., and her pulse rate lay between 60 and 80 per minute on all but a few occasions during ten days of observation. She had no diabetic symptoms. Two of seven casual urine specimens contained a trace of glucose. Her fasting blood sugar was 113 mg. per 100 cc.; a single specimen taken one hour after a meal

was 192 mg. She was discharged with the diagnosis of "anxiety state, with slightly enlarged thyroid."

Several months after this hospital admission she discovered her husband with his mistress in a bus station. After a violent scene in which she attempted to "beat them both up," she again became depressed and bitterly resentful toward him. She felt unable to leave him, but constantly nagged at him, berated him, and begged him to take better care of her. Her glycosuria reappeared and her physician again prescribed ten units of protamine insulin. One year after her first admission she was re-admitted to

the hospital. On this occasion all of her urine specimens contained "2 plus" to "4 plus" glucose, her fasting blood sugar was 116 mg. per 100 cc., and the level rose to 319 mg. one hour after a standard oral dose of glucose, falling to only 251 mg. after three hours. On the advice of an endocrinologist a thyroidectomy was performed. The pathological diagnosis was "non-toxic nodular goiter."

After two months' subjective improvement, all her symptoms returned. For a year she remained a semi-invalid at home; requiring 6 to 12 units of protamine insulin a day. Finally, because of the fluctuations in her diabetic state, she was referred to the investigators.

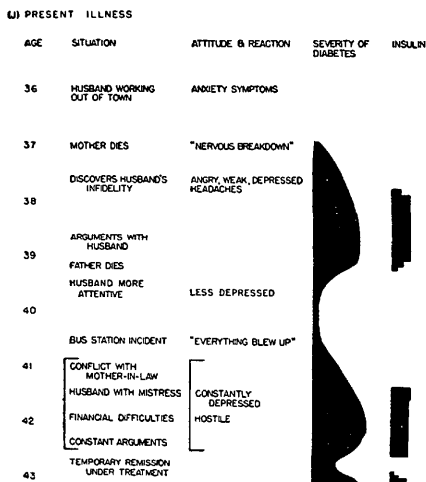


FIG. 11. Case J. Life experiences, reactions, and course of diabetes during seven years of observation.

Course under Observation

When she was first seen she had lost no weight and her physical findings were unchanged. Her BMR was -3 , and her pulse rate varied between 70 and 90 per minute. On a prescribed diet of P 100, F 100, C 200 (2100 calories) and without insulin, she spilled no sugar during twelve days of hospital observation except for small amounts post-prandially. Nevertheless, an oral glucose tolerance test showed her initial fasting level to be 149 mg. per 100 cc., with a rise to 412 mg. after two hours, and a level of 291 mg. after three hours. The immediate circumstances surrounding this test are not known. During her hospital stay she was depressed, tearful, anxious, and unable to sleep. During the day she complained constantly about her many symptoms, or expressed bitter resentment toward her husband. Upon her return home she applied all of her energy to keeping herself and her house meticulously neat and clean, and to following her physician's instructions in minute detail.

Utilizing her compulsive attitude toward her treatment, the investigator instructed her to follow the prescribed diet carefully, recording on cards everything that she ate, as well as the volume of each urine specimen, the time voided and the reaction to Benedict's qualitative reagent. At intervals of approximately a week she reported to the clinic, bringing with her all of her urine for the previous twenty-four hours, which was measured and analyzed quantitatively. In addition she kept a diary in which she recorded the events of each day, her attitudes and feelings toward them, her ruminations and random thoughts. At her clinic visits the events of the preceding days were reviewed with her, with special attention to her recollections and associations. The results of these observations are charted in Figs. 12 and 13. During the period of these observations she received no insulin.

It was found that periods of heavy glycosuria corresponded with times during which she felt consciously depressed, lonely, and bitterly resentful of her husband. Such periods were precipitated not only by grossly

evident occurrences such as her husband's departure for a week-end with his mistress, but also by events such as the anniversary of her mother's death, which would not be evident to the casual observer, but could be discovered only by careful questioning and observation, and evaluated only by one who knew of the significance of this date to her. At such times typical comments in her diary were: "Cried during breakfast, wondering if my life will always be this way, nothing to look forward to, no companionship, nowhere to go." She had dreams of her husband, in which hostility was evident, and sexual desire easily uncovered. Dreams of her mother included evidences of tender longing which were easily elicited, and bitter hostility which was uncovered only against strong resistance.

Periods of relatively less glycosuria corresponded with times when her husband and son were at home and solicitous, and her husband promised to "reform." Then she felt less depressed and resentful, but was more "nervous" and had more evident neurotic symptoms. In this respect this patient resembled the patients described by Meyer, Bollmeier, and Alexander (8), whose diabetic exacerbations alternated with overtly neurotic behavior. A typical comment from her diary written at such a time is as follows: "Extremely nervous feeling in stomach; belching; lump in throat; eyes feel heavy and smart; pain over temples and dull ache around back of head; hands ice cold, middle fingers right hand feel numb." During such pe-

riods she had dreams containing many male sexual symbols and scarcely concealed representations of intercourse with men resembling her husband and father.

The twenty-four-hour urine volumes of this patient fluctuated relatively little, in the range between 1000 and 2000 cc. Urine volume did not necessarily parallel fluctuations in her glucose output. Neither did the amount of glucose in her urine reflect either her carbohydrate intake or her total food intake. To illustrate these two points, three of the twenty-four-hour urine specimens which were analyzed quantitatively are diagrammed in Fig. 14. On the day of the first specimen, when she was anxious and self-concerned, her total

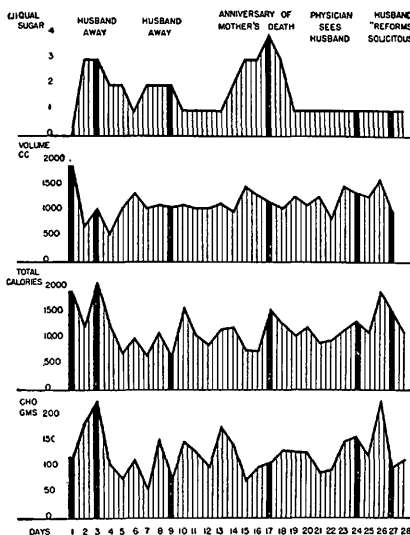


FIG. 12. Case J. Diagram of first twenty-eight days of observation. Solid black columns represent days on which quantitative measurements of total urinary constituents were made in the laboratory.

urine output was 1960 cc., containing only 10.8 Gm. of glucose. On this day she consumed 1929 calories, including 120 Gm. of carbohydrate. On the day of the fifth specimen she was also anxious and self-concerned. On this day she excreted 13.8 Gm. of glucose in 1380 cc. of urine. Her total caloric intake was much smaller (1367 calories) but her carbohydrate intake was greater (162 Gm.). On the day of the eighth specimen she was hostile and depressed. On this day she excreted 100 Gm. of glucose in only 1020 cc. of urine, although her total food intake was 1550 calories, including 121 Gm. of glucose.

Comment

It is recognized that the calculation of caloric intake reported by diabetic persons may be highly unreliable. Many of them have an intense desire to eat when they are lonely or depressed, and conceal what they eat to avoid their physician's disapproval. This woman was selected for this study with these limitations in mind, because it was felt that these errors would be largely offset by her compulsive need to follow the physician's directives explicitly, and her morbid fear that if she ate "forbidden" carbohydrate foods she would promptly go into coma. Because of this she usually erred on the side of eating less than her prescribed diet. Nevertheless, she sometimes ate candy bars, cake, and pieces of pie.

On each occasion when she reported these lapses promptly she was given strong approval and reassurance by the investigator. During this time and during two years of subsequent observation we have found no reason to suspect that during the period of the experiments any major dietary lapses were concealed.

Tolstoi and Weber (9) found that diabetic patients on a metabolic ward, with a fixed intake of food and fluids, excreted highly variable amounts of water and glucose from day to day. It has be-

come apparent from several types of evidence that the polyuria which occurs in diabetic persons is not necessarily the result of an osmotic diuresis caused by the excretion of large quantities of glucose in high concentration (2).

Subsequent Course

On later occasions short-term laboratory studies were done on this woman which were similar to those previously described (1). On a day when she was feeling relatively cheerful and her husband was being attentive, a control study was made throughout a morning in which the physician maintained a protective and sympathetic attitude toward her. During this period (Fig. 15) there was no significant change in her

blood glucose and ketone levels and in her rate of urine formation. On another day, shortly after the anniversary of her mother's death, at a time when her husband was spending much time with his mistress and the patient was feeling sad, lonely, and unloved, a second study was performed (Fig. 16). At the time of her arrival she was tense and depressed. Her blood ketone level was 2.4 mg. per 100 cc., which is only slightly higher than that usually found in nondiabetic persons in the morning after an overnight fast (1). Her urine output rate was 0.4 cc./min. During

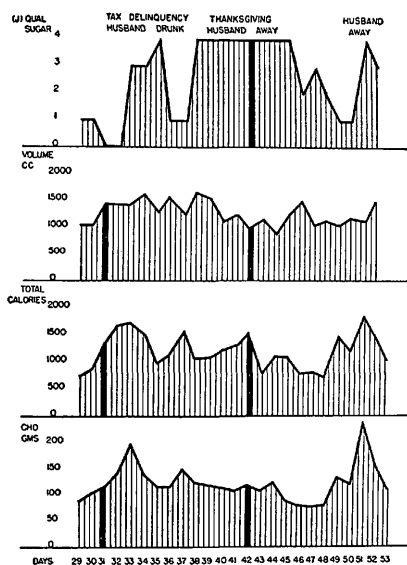


FIG. 13. Case J. Diagram of days 29 to 53 of observation period.

the next hour the physician behaved in a friendly and protective manner, and attempted to divert her with a neutral conversation. During this period she became more cheerful and her morbid ruminations ceased, but she became somewhat more tense and apprehensive; her blood ketone level fell to 0.6 mg. per 100 cc., but her rate of urinary excretion of water, glucose, chlorides, and ketones more than doubled. At the end of the conversation she was allowed to sit quietly for another hour, during which she resumed her sad and bitter thoughts

about her husband and her mother, and again began to feel lonely, unloved, depressed, and resentful. Her blood ketone level rose thereupon to 2.4 mg. and remained elevated. However, after a third hour during which she was again provided with attention and diversion her ketone level had again fallen to 0.6 mg., and her urine volume had likewise fallen somewhat.

The changes in her blood ketone level during the stress experiment are small but of significant magnitude. It has been found (1) that persons with relatively low initial ketone levels respond to roughly equivalent stressful situations with smaller increases in ketone concentration than do those individuals with higher initial levels. The changes in her urinary excretion rates are quite small in total magnitude, but they likewise are probably significant, inasmuch as there was no change in activity, posture, or fluid intake which could account for them, and also because they are qualitatively similar to the changes in urinary excretion observed in both diabetics and non-diabetics under stress (2, 3). It is possible that the glucose which was found in the initial specimens of urine had been excreted at a previous period when the blood glucose was much higher, since there is a "lag" in both time and volume between the excretion of urine by the renal tubule and its appearance in the bladder. However, other studies on this patient as well as other subjects have indicated that there are some persons who have glycosuria at lower blood sugar levels when they are under stress than they do when they are not under stress (4).

Management of this patient with close attention to her life problems and conflicts in visits at intervals of once a week produced little change in her state over the course of a year. For an initial period

of months during which she was encouraged by the vigorous interest of the investigator and hoping he would eliminate her symptoms, she had relatively few diabetic symptoms and required no insulin. In therapy, however, she never passed beyond the stage of describing her symptoms at length and complaining futilely about her husband. She was unable to take even the simplest action to improve her life situation. Her husband visited the physician and "promised to reform," but continued to behave

as he always had. Her son was found to be a neurotic invalid who was also unable to make a constructive contribution to the situation. On two occasions arrangements were made for hospitalization in the Payne Whitney Psychiatric Clinic as a free patient. On each occasion she found a trivial excuse for postponing her admission. With the passage of time many of her somatic symptoms disappeared, and she became increasingly depressed and resentful toward her physician. In this setting her glycosuria increased and she began to lose weight. Insulin therapy was begun again and for the subsequent year of observation she required 20 units

of protamine insulin a day to maintain her weight and control her symptoms. She was urged to eat relatively freely of a normal diet but she persisted in sharply restricting her food intake "for fear of going into coma."

Discussion

The three cases presented are typical of an unselected group of persons with mild, "stable," "adult" diabetes whom we have studied. Although it is recognized that one cannot draw general inferences concerning diabetes from a study of three cases, it is nevertheless of interest to examine cer-

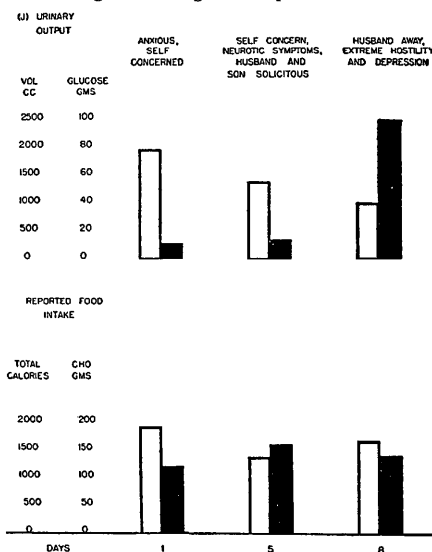


FIG. 14. Case J. Quantitative measurements of food intake and urinary output during three representative twenty-four-hour periods, showing lack of positive correlation between caloric intake and total carbohydrate intake on the one hand, and urine volume and glucose excretion on the other hand.

tain common characteristics which these three persons share with the three juvenile diabetics described at length in the previous paper (5).

All of these persons responded to stressful situations with an increased desire to eat. Subject N recognized this characteristic of her behavior, and explained her obesity on this basis. Subject T remembered that he had always liked to eat, but did not find the desire insurmountable after he was asked to restrict his diet. However, during the earlier period in which his diabetes was developing and he was having repeated surgical operations, his weight increased gradually but steadily. Subject J, even though compelling psychological drives made her fear eating, nevertheless found herself unable to resist the temptation of candy and cake when she was lonely.

In all of these patients the onset of the manifestations of diabetes occurred in a setting of significant and sustained life stress. In Subject T the hospital record shows the increasing severity of glycosuria and hyperglycemia which occurred in a man who successively lost his wife, his fortune, his job, and much of the right side of his face. In Subject N glycosuria, thirst, polyuria, and weight loss appeared after the successive deaths of her mother and sister, who were her primary sources of emotional support. In Subject J, hyperglycemia and glycosuria appeared after the death of her mother and the defection of her husband, who were likewise her primary sources of emotional support. Each of these subjects reacted to these successive stresses with strong feelings of deprivation, loneliness, and depression. These are the same attitudes and feelings as those with which the juvenile diabetics reacted to the stresses which preceded their diabetic symptoms.

All of these subjects appear to have felt significantly deprived of the love and attention of their mothers during childhood. The mother of Subject N was typically like the mothers of most of the diabetic girls whom we have seen: a dominant, cold, undemonstrative woman, who was restrictive and overprotective, and who expressed approval only by material gifts. The father of Patient T was overpowering and punitive to such an extent that his son seemed to associate all attachments to mother as dangerous, and never felt that his need

for her was fulfilled.

The history of Patient J was like that of Patient T and unlike that of most of the diabetic women in this respect. This, plus her early sexual experiences with her father, may explain why the most evident aspects of her total illness were those of a severe psychoneurosis, whereas most adult diabetics do not appear neurotic to the casual observer. All three of these patients also had early experiences which appear to have strongly conditioned the relation between food and mother love. Note how the mother of Patient N bought her clothes and fixed special foods for her when she was good, how the father of Pa-

tient T punished him by making him stand and watch the family eat supper while his mother was forbidden to comfort him, and how the mother of Patient J could express her love for her daughter only by surreptitiously buying her candy. Finally, in all three of these persons the onset of their diabetes occurred after a series of losses of significant supports to their emotional security. They reacted to these losses both consciously and unconsciously as if each represented a deprivation of love and security, and felt consciously sad and lonely. We have pointed out elsewhere (6) that the metabolism of the diabetic is strikingly similar to that of the non-

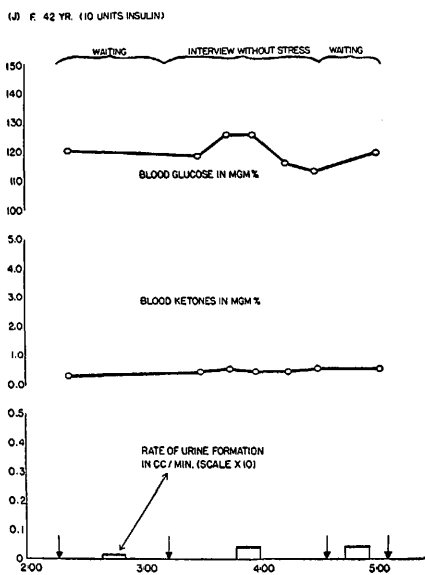


FIG. 15. Case J. Changes in blood glucose, blood ketones, urine volume, and urine sugar excretion during a control interview without stress. For comparison with Fig. 16.

diabetic man during total starvation, and we suggested that the three juvenile diabetics who were previously described might be considered as reacting to the cumulative stresses of their lives as if they represented threats of starvation. The life histories of these three adult diabetics, as well as those of all the others whom we have studied, are compatible with this hypothesis.

It is commonly felt that adult diabetes is a relatively stable disorder, without fluctuation, but a careful examination of the histories of these patients, as well as our own clinical experience with a large number of others in this group, reveals that even the mildest form of diabetes fluctuates in severity. The glycosuria of Subject T at first largely disap-

disease have been observed in all of the adult diabetics whom we have studied.

In spite of the absence of any qualitative difference between these adult diabetics and the juvenile diabetics in those aspects of their psychology and physiology which were studied, there were quantitative differences which were quite obvious. The adults had successfully surmounted the obstacles of life for many years before they broke down with obvious illness. Two of these patients still appeared superficially cheerful and "well-adjusted" when they were first seen. The cumulative stresses to which they were exposed would be generally considered in our culture to have been major misfortunes. The juveniles, on the other hand, had failed

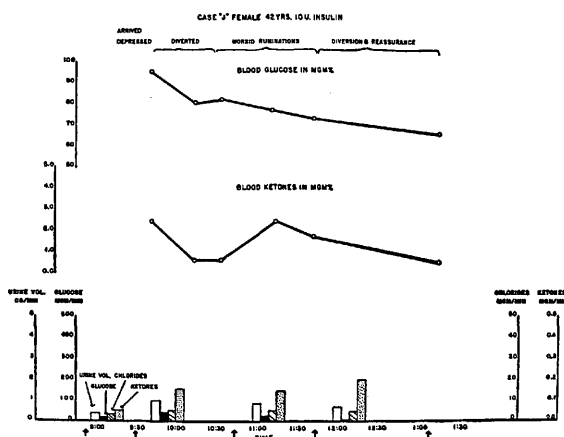


FIG. 16. Case J. Changes in blood sugar, blood ketones, urine volume, and urine glucose, ketone, and chloride excretion, accompanying changing thoughts and feelings.

peared when he was discharged from the hospital, but reappeared with increasing severity each time he was admitted for another disfiguring surgical operation. Subject N required no insulin until the time of her father's final illness and death, when her symptoms became much more severe. This same subject was observed to develop a transient but definite thirst, polyuria, and weight loss, after a threatened eviction by her landlord. The fluctuations of the diabetes of Subject J and their relation to her difficulties with her husband have been described at length. Although these fluctuations have not the dramatic severity of the explosive ketosis often seen in juvenile diabetics under similar circumstances, they are readily apparent to the careful observer. Similar fluctuations in the severity of the

to make satisfactory adaptations from very early in their childhood, and succumbed to apparently trivial incidents which might be considered in our culture "a normal part of growing up." The significance of these incidents became apparent only when their conscious and unconscious meaning to the patients was understood. This tendency of the juvenile diabetics to become ill in the face of earlier and less openly significant stresses might be considered as evidence of a constitutional difference between the two groups, but it is equally tenable that this difference is based upon the presence of earlier and more intense disturbance of the mother-child relationship.

The generalizations which apply to the onset of

the disease apply equally to its fluctuations. The adult diabetic in a stressful situation developed a moderate increase in polyuria and glycosuria, and a slight weight loss. The juvenile in a similar situation often developed an explosive ketosis and dehydration, ending in coma. The tense, depressed, and lonely adult may eat a piece of candy or a slice of cake. The juvenile in a similar situation may eat everything in the icebox and everything he can buy at the drugstore.

Nevertheless, it is misleading to think that persons with diabetes may be graded in severity and lability mainly according to age. In our group there are labile diabetics with high insulin requirements whose illness developed after the age of 70, and stable diabetics with low insulin requirements whose disease began at 14. We have observed a housewife of 60 develop an explosive ketosis when her husband "fell off the water-wagon" and came home drunk, and a girl of 19 to develop no symptoms severe enough to demand treatment after she had been told that she had retinitis proliferans and faced imminent blindness. There are diabetics of all grades of severity and all grades of lability; the great mass of them do not appear to fall into two distinct groups, but into one large group which shades off into extreme examples at either end of the distribution curve. The "adult diabetics" in this study and the "juvenile diabetics" in the former study are far enough apart on the curve to look like members of different groups, but when the intermediate members of the group are considered the apparent difference disappears. The fact that the disease is generally more labile and difficult to control in young individuals appears to us to be due more to the special characteristics of childhood and adolescence *per se* than to any qualitative metabolic peculiarity of the diabetes of children.

Conclusions

The life histories of three persons with mild, "stable," diabetes mellitus have been presented in detail. From long-term observations of their course and short-term experimental studies under controlled conditions, the following conclusions may be drawn:

1. Over-eating was a part of the characteristic response of these patients to stress.
2. The onset of the symptoms of diabetes in these persons occurred in a setting of significant life stress.
3. Exacerbations of the diabetes, associated with increased glycosuria, polyuria, and weight loss, were observed to occur in association with subsequent and often similar stresses in the life situation,

and took place even if there were no significant change in their insulin intake, diet, or activity, and in the absence of infection or trauma.

4. Remissions of the diabetes, associated with reduced insulin requirements or fewer symptoms, occurred during periods of relative security.

5. Under controlled laboratory conditions these patients developed a prompt increase in ketonemia when presented with stressful situations which aroused in them significant personal conflicts. The ketonemia subsided when the stress was removed.

The various studies which were made on these patients revealed no qualitative difference between them and the three severe, labile diabetic persons who were studied previously. Striking quantitative differences between the two groups were observed, however.

In the discussion of these observations it was pointed out that the findings in these three cases are consistent with the hypothesis that diabetes mellitus is a disorder of adaptation, and that persons showing this disorder react to various life stresses with a physiological response which is appropriate to starvation, but ineffective in dealing with the stresses to which they have been exposed.

Bibliography

1. HINKLE, L. E., JR., CONGER, G. B., and WOLF, S.: *Studies in diabetes mellitus: The relation of stressful life situations to the concentration of ketone bodies in the blood of diabetic and non-diabetic humans*. J. Clin. Investigation 29:754, 1950.
2. HINKLE, L. E., JR., EDWARDS, C. J., and WOLF, S.: *The life stress and water balance in diabetes mellitus*. J. Clin. Investigation 19:821, 1950.
3. HINKLE, L. E., JR., EDWARDS, C. J., and WOLF, S.: The occurrence of diuresis in humans in stressful situations and its possible relation to the diuresis of early starvation. In preparation.
4. HINKLE, L. E., JR., EDWARDS, C. J., and WOLF, S.: Unpublished data.
5. HINKLE, L. E., JR., EVANS, F. M., and WOLF, S.: *Studies in diabetes mellitus, III: Life history of three persons with labile diabetes, and relation of significant experiences in their lives to the onset and course of the disease*. Psychosom. Med. 13:160, 1951.
6. HINKLE, L. E., JR., and WOLF, S.: "Studies in diabetes mellitus: Changes in glucose, ketone, and water metabolism during stress." In *Life Stress and Bodily Disease*. Proceedings of the Assn. for Res. in Nerv. and Ment. Dis., Vol. 29, p. 338, 1950.
7. HINKLE, L. E., JR., and WOLF, S.: *The effect of stressful life situations on the blood glucose of diabetic and non-diabetic persons*. To be published.
8. MEYER, A., BOLLMEIER, L. N., and ALEXANDER, F.: *Correlation between emotions and carbohydrate metabolism in two cases of diabetes mellitus*. Psychosom. Med. 7:335, 1945.
9. TOLSTOI, E., and WEBER, F. C.: *Protamine insulin, a metabolic study*. Arch. Int. Med. 64:91, 1939.